

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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| Applicant: | Kyung Sang Cho |) |
| | |) Group Art Unit: 2889 |
| Serial No.: | 10/580,394 |) |
| | |) Examiner: |
| Filed: | May 22, 2006 |) BREVAL, Elmito |
| | |) |
| For: | QUANTUM DOT LIGHT-EMITTING |) |
| | DIODE COMPRISING INORGANIC |) Confirmation No.: 1954 |
| | ELECTRON TRANSPORT LAYER |) |

PRE-APPEAL BRIEF REQUEST FOR REVIEW

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Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

In response to the Final Office Action mailed March 2, 2011, and in conjunction with the Notice of Appeal filed concurrently herewith, the Applicants submit the following remarks in support of the Pre-Appeal Brief Request for Review:

REMARKS

The present submission is responsive to the Final Office Action of March 2, 2011, in which claims 1-5 and 7-10 are currently rejected. Reconsideration is respectfully requested in view of the following remarks.

Claim Rejections Under 35 U.S.C. § 103

For an obviousness rejection to be proper, the Examiner is expected to meet the burden of establishing why the differences between the prior art and that claimed would have been obvious. (MPEP 2141(III)) “A patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art.” *KSR Int’l Co. v. Teleflex Inc.*, 127 S.Ct. 1727, 1741 (2007). To find obviousness, the Examiner must “identify a reason that would have prompted a person of ordinary skill in the art in the relevant field to combine the elements in the way the claimed new invention does.” *Id.* Also, to establish *prima facie* obviousness of a claimed invention, the prior art references must teach or suggest all of the claim limitations. (MPEP 2143(A)(1))

Claims 1, 2, 4, 5, 8 and 9 stand rejected under 35 U.S.C. § 103(a) as being allegedly unpatentable over Bulovic et al. (U.S. Patent Publication No. 2004/0023010, hereinafter “Bulovic”) in view of Jain et al. (U.S. Patent no. 6,797,412, hereinafter “Jain”) and further in view of Chen et al. (U.S. Patent Publication No. 2004/0251824, hereinafter “Chen”).

Claims 3 and 7 stand rejected under 35 U.S.C. § 103(a) as being allegedly unpatentable over Bulovic in view of Jain and Chen, and further in view of Kishigami (Japanese Patent No. 200-215984, hereinafter “Kishigami”).

Claim 10 stands rejected under 35 U.S.C. § 103(a) as being allegedly unpatentable over Bulovic in view of Kishigami and further in view of Chen.

Applicants respectfully traverse the rejections for the reasons set forth below.

Amended independent **Claims 1 and 10** similarly recite, *inter alia*:

- a top electrode;
- a bottom electrode disposed substantially opposite the top electrode and *on a substrate including a polyethyleneterephthalate or a polycarbonate substrate*;
- an inorganic quantum dot light-emitting layer provided between the top electrode and the bottom electrode; and

an inorganic electron transport layer disposed between the inorganic quantum dot light-emitting layer and the top electrode.”

In making the rejection of independent claim 1, the Examiner states that Bulovic does not disclose that the electron transport layer (“ETL”) is inorganic and that the substrate is polyethyleneterephthalate (“PET”) or polycarbonate (“PC”), states that Jain is silent as to PET or PC, alleges that Chen teaches a device wherein the substrate is made of PC, and states that it would have been obvious to use the inorganic ETL of Jain in the device of Bulovic and to further modify with the PC substrate of Chen. Final Office action of March 2, 2011, pp. 3-4. Similarly, regarding independent claim 10, the Examiner alleges that Bulovic does not disclose that the ETL is inorganic, that Kishigami is silent as to PET or PC, states that Chen teaches a device wherein the substrate is made of PC, and states that it would have been obvious to replace the ETL of Bulovic with the inorganic ETL of Kishigami and to further modify with the PC substrate of Chen. Final Office action of March 2, 2011, pp. 7-8.

As agreed in the Examiner Interview of December 3, 2010, amended independent claim 1 is patentable over Bulovic and Jain. Examiner Interview Summary of December 18, 2010.

Bulovic is directed towards a light-emitting device including semiconductor nanocrystals, the device including **a substrate 1 (Glass in FIG. 2)**, a first electrode 2 (ITO in FIG. 2), a first layer 3 (a hole transporting layer TPD:QDs in FIG. 2), an organic light-emitting layer of Alq3 (shown only in FIG. 2, but discussed as being between layers 3 and 4 with respect to an alternative embodiment of FIG. 1), a second layer 4 and a second electrode 5 (Mg:Ag and Ag in FIG. 2). (See FIGS. 1-2B and the associated description thereof in the specification of Bulovic).

Therefore, Bulovic *does not teach or suggest* **a bottom electrode disposed substantially opposite a top electrode and on a substrate including a polyethyleneterephthalate or a polycarbonate substrate, an inorganic quantum dot light-emitting layer provided between the top electrode and the bottom electrode, and an inorganic electron transport layer disposed between the inorganic quantum dot light-emitting layer and the top electrode** of amended independent Claims 1 and 10.

Jain discloses a substrate made of sapphire or silicone and a thick semiconductor layer is disposed on the substrate, and thus a flexible device also cannot be made by Jain, contrary to the claimed invention.

Therefore, even if the inorganic electron transport layer of Jain were used in the device of Bulovic for the purpose of enhancing the electron injection to the light emitting layer and to improve the luminance efficiency of the device, as asserted in the instant Office action, the combined structure would *not teach* **a bottom electrode disposed substantially opposite a top electrode and on a substrate including a polyethyleneterephthalate or a polycarbonate substrate, an inorganic quantum**

dot light-emitting layer provided between the top electrode and the bottom electrode, and an inorganic electron transport layer disposed between the inorganic quantum dot light-emitting layer and the top electrode of independent Claims 1 and 10.

Kishigami discloses an organic electroluminescent element including a cathode 2, an electron transport layer 3, an organic electroluminescent layer 4, a hole transport layer 5, an anode 6 and a substrate 7. (See Abstract, associated figure and Title of the invention). The substrate of Kishigami uses a glass or metal, and thus a flexible device cannot be implemented by Kishigami, contrary to the claimed invention. Therefore, even if the electron transport layer of Bulovic were replaced with the inorganic electron transport layer of Kishigami for the purpose of enhancing the electron injection to the light emitting device and to improve the luminance efficiency of the device, as asserted in the instant Office action, the combined structure would *not teach* a bottom electrode disposed substantially opposite a top electrode and on a substrate including a polyethyleneterephthalate or a polycarbonate substrate, an inorganic quantum dot light-emitting layer provided between the top electrode and the bottom electrode, and an inorganic electron transport layer disposed between the inorganic quantum dot light-emitting layer and the top electrode of amended independent Claims 1 and 10.

Chen discloses a full color display panel with a mirror function comprising an organic light-emitting area 11 comprising a first electrode 111, an organic functional layer 112, and a second electrode 113. Chen, Fig. 2 and p. 2, [0025]. Chen also discloses that the organic light-emitting area 11 is on spectrum modulation layer 12, and on a color separating layer 13, which in turn is on color filters 132, which are on a transparent substrate 14. Chen, p. 3, [0037].

First, because the prior art does not suggest the desirability of the modification suggested by the Examiner, one of ordinary skill in the art would not have been prompted to modify Bulovic, Jain, and Kishigami as suggested by the Examiner, let alone have an expectation of success.

“Although the Commissioner suggests that [the structure in the primary art reference] could readily be modified to form the [claimed] structure, ‘[t]he mere fact that the prior art could be so modified would not have made the modification obvious unless the prior art suggested the desirability of the modification’” (citation omitted) *In re Laskowski*, 871 F.2d 115, 117, 10 U.S.P.Q.2d 1397, 1398 (Fed. Cir. 1989); also obviousness cannot be established “by combining the teachings of the prior art to produce the claimed invention, absent some teaching or suggestion that the combination be made”. *In re Stencel*, 828 F.2d 751, 755, 4 U.S.P.Q.2d 1071, 1073 (Fed. Cir. 1987). Thus because there is no teaching or suggestion in the cited to combine or remove the elements of the prior art to produce the present invention as suggested by the Examiner, the present invention is thus nonobvious over Bulovic, Jain, Kishigami, and Chen, either alone or in combination.

Second, because Chen teaches a full color display panel in which a spectrum modulation layer and a color separating layer are interposed between an organic light-emitting area 11 and the substrate

14, and thus teaches a device which is distinct from that of Bulovic, Jain, or Kishigami, one of ordinary skill in the art would not have been prompted to modify Bulovic, Jain, and Kishigami as suggested by the Examiner, let alone have an expectation of success.

Third, because Bulovic teaches a glass substrate, because Jain teaches sapphire or silicone, and because Kishigami uses glass or a metal, one of ordinary skill in the art would not have been prompted to dispense with the materials disclosed in Bulovic, Jain, and Kishigami and use the polycarbonate of Chen as suggested by the Examiner.

Therefore, since Bulovic, Jain, Kishigami, and Chen, alone or in combination, *fail to teach or suggest* all of the limitations of at least amended independent Claims 1 and 10, a *prima facie* obviousness does not exist regarding amended independent Claims 1 and 10 with respect to Bulovic, Jain, Kishigami, and Chen, and thus claims 1 and 10 are allowable. As Claims 2-5 and 7-9 variously depend from Claim 1, they are correspondingly allowable.

Reconsideration and withdrawal of the claim rejections under 35 U.S.C. § 103 and allowance of Claims 1-5 and 7-10, and allowance of the instant claims, are respectfully requested.

Applicants hereby petition for any necessary extension of time required under 37 C.F.R. 1.136(a) or 1.136(b) which may be required for entry and consideration of the present Reply.

In the event the Commissioner of Patents and Trademarks deems additional fees to be due in connection with this application, Applicants' attorney hereby authorizes that such fee be charged to Deposit Account No. 06-1130.

Respectfully submitted,

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